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ABSTRACT

The purpose of the paper is to address the instructional use of the microcomputer at the community college level. Specific attention is given to two principal types of microcomputer instructional use: computer managed instruction and computer assisted instruction (CAI). Five computer managed instruction applications are discussed: (1) the word processor for the generation of tests, outlines, syllabuses, and manuscripts; (2) the spelling checker for faster typing and the elimination of errors; (3) record keeping programs for assisting in classroom attendance and grade maintenance functions; (4) the file system for storing student data, course bibliographies, and research activities; and (5) graphing programs for the creation of graphs for classroom use. Following a brief discussion of self-authored and purchased courseware, three forms of CAI are discussed: drill and practice, tutorial, and simulation. The paper warns that certain conditions can be anticipated when using computer assisted instruction, such as lack of typing skills and fear of microcomputers by some students. The importance of the number of students and the structure of a team assigned to a microcomputer is emphasized. Eleven conclusions are listed, followed by appendices containing a sample grade sheet, a sample classroom graph, a list of courseware review sources, and a list of earth science courseware. (LH)

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INSTRUCTIONAL USE OF THE MICROCOMPUTER: PERSONAL EXPERIENCES

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INTRODUCTION

As microcomputers have moved into many areas of contemporary society (Friedrick, 1983), interest in instructional uses of microcomputers has emerged on the community college campuses (Naiman, 1982). The interest prompted committees to be formed which examine the types of equipment (Graef, 1982) while a body of literature began to be identified (ERIC, 1983). Concomitantly, staff development activities on computer literacy began (The, 1982; Minnesota Educational Computing consortium, 1982).

Questions from faculty addressed the issue of what it was like to actually use the microcomputer in an instructional situation: Would it help or hinder the instructor? What can the instructor expect from the students when they are confronted with the microcomputer? Is there any good instructional computer material? How is the microcomputer used in a classroom?

PURPOSE

The purpose of this paper is to address the questions about instructional use of the microcomputer. The answers are drawn from personal experience. The experience includes my use of the microcomputer in community college earth science courses (geography and geology), serving as facilitator of microcomputer workshops and library research. The

equipment used in these activities was the Apple II+ microcomputer, single disk drive, Zenith monitor and Epson MX 80 printer.

Specific attention is given in this paper to the two principle types of microcomputer instructional use (Olds, et. al., 1980):

1. Computer Managed Instruction.
2. Computer Assisted Instruction.

COMPUTER MANAGED INSTRUCTION

Computer managed instruction (CMI) occurs when the microcomputer is used by the instructor in support of classroom activities. I have focused on five CMI applications.

1. Word Processing. A review of the available word processing programs indicated that there was an inverse relationship between a program's ease of use and its degree of sophistication. If the program was easy to learn how to use, one would quickly outgrow it in terms of one's word processing needs. On the other hand, a more complex, difficult to learn program was one which may satisfy unanticipateD, future word processing needs. I chose a rather difficult to learn program (*Screenwriter II*, 1981). It took approximately ten hours of study to use it in simple way.

I use the program for the generation of tests, outlines, syllabuses and manuscripts such as this paper.

Benefits. I feel that there are at least three

benefits to using a word processing program.

1. Word processing can save time. It eliminates the need for retyping and corrections can be made quickly. Tests can be revised by "electronic" cut and pasting. The same ease of revision applies to course outlines, syllabuses and manuscripts.

2. Overhead transparencies are given a professional appearance by first typing the information using the variety of type sizes and styles available through word processing and the printer. The final product is converted into an overhead transparency.

3. Written text takes on a quality appearance through the use of right and left justification of margins. (Note the margins of this paper).

Special Considerations. I have identified three special considerations related to using a word processing program.

1. In order to have the word processed material converted into a paper copy, one needs access to a printer. This paper was printed by a correspondence quality (dot matrix) printer. Other types of printers are letter quality and heat process printers.

2. It may take time and practice to become comfortable with reading text from a computer monitor. Related is the problem of not seeing the text in its finished form until it is printed.

3. It is possible to lose word processed material in the microcomputer/program if procedures are not followed exactly as set out in the instruction manual. Also, loss can occur if there is a power failure.

2. **Spelling Checker.** Related to word processing is a program which checks the spelling of words within a written statement. The program I use (*Sensible Speller, 1983*) contains over 70,000 words and uses the Random House dictionary as its data base. The spelling checker can be modified to include special words.

Benefits. There are two benefits to using a spelling checker.

1. Spelling errors are virtually eliminated within documents.

2. Typing can occur much faster as a result of not worrying about spelling or typographical errors.

Special Considerations. A major consideration is being aware that the program does not verify the context of a word. Hence, there is a need for one to make certain that the spelling is appropriate for the context.

3. **Record Keeping.** There are numerous programs on the market to assist the classroom attendance and grade maintenance function. I use a general purpose spread sheet program (*VisiCalc*, 1979). A spread sheet is a system of rows and columns which form grid cells. The user can determine a

function within each cell. For example, a student's name can be in one cell and a test score in another cell (Appendix A).

Benefits. There are three benefits to using a record keeping program.

1. It will help keep one's records orderly.
2. A few key strokes can provide a printed summary of individual or class attendance, test scores and course grades.
3. The volume of stored paper records is greatly reduced.

Special Considerations. The use of a record keeping system involves at least two considerations.

1. All of the information must be typed into the program. Hence, one may desire typing assistance.
2. I found that a class size of at least 35 students was required to justify the setup time.

4. File System. The file system is a series of electronic 3 X 5 inch "cards." The file system I use (*PFS:File*, 1982) serves as a student data base which includes the student's name, residence, telephone number, previous course work, areas of interest, etc. I also use the file system for course bibliographies and research activities such as this paper.

Benefits. The benefits are two fold.

1. Assembling diverse student information into a

coherent print out is much easier.

2. The indexing capabilities of the program provides increased flexibility in assembling bibliographies.

Special Considerations. There are two major considerations.

1. The creation of a "card" requires time and considerable planning.

2. There is a need to keep the "cards" updated.

5. **Graphing.** Graphing programs facilitate the conversion of numerical information into a visual illustration. The information can be drawn as a line, bar or pie chart. Presently, I am using a graphing program (*PFS:Graph*, 1982) for creating graphs for classroom use (Appendix B).

Benefits. There are at least three benefits associated with the use of a graphing program.

1. The construction of attractive graphs can be done quickly.

2. The graphs can be converted into overhead transparencies.

3. Once the graph is developed, information on it can be easily changed and printed.

Special Consideration. The only special consideration I have experienced is the need to initially record the information in a format usable by the graphing program.

COMPUTER ASSISTED INSTRUCTION

Computer assisted instruction (CAI) involves the interaction between the microcomputer and the student in a learning situation. CAI consists of the educational programs (courseware) and the forms of instruction.

COURSEWARE.

I found that were two major ways to obtain courseware.

1. **Self Authored Courseware.** One can author one's own courseware. This involves using a language which the microcomputer understands such as Basic, Pascal or Pilot.
2. **Purchased Courseware.** One can purchase existing courseware. Having neither the time nor inclination to develop an expertise in a microcomputer language, I decided to pursue commercially available courseware. Initially, I ask colleagues about courseware. Their replies tended to be either "there is no courseware available" or "there is no quality courseware available."

Unsatisfied with the responses, I went to the computer stores. The sales people were helpful although their expertise centered on computers and related equipment. While in the stores, I became familiar with many journals, periodicals and indices which contained reviews of courseware (Appendix C). Subsequent research allowed me to conduct my own reviews using the courseware available for preview in the

computer stores (Intentional Educations, 1982; Naiman, 1982).

Over a period of six months, I assembled a bibliography of earth science courseware which, for the most part, had been classroom tested. I am currently using several of the programs in my classes (Appendix D).

FORMS OF CAI

Presently, I am utilizing three forms of CAI.

1. **The Drill and Practice Mode.** With drill and practice, the courseware poses a question which the student answers. The answer draws from the student's previously acquired knowledge of the topic. The courseware informs the student if the answer is correct or incorrect and poses another question. Th question/answer process continues until either the student terminates the session or the courseware questions are exhausted.

The students have indicated that drill and practice works well when they need a review or remedial work. However, it becomes tedious when they need supplemental information and/or instructional assistance.

2. **The Tutorial Mode.** The student interacts with the course material and microcomputer through a series of questions posed by the courseware.

The courseware responds to the student answers in two ways.

A. It provides a response to the student answer. If a correct answer is given, the courseware may ask another question, provide supplemental information or suggest activities which expand upon the subject.

B. If the student makes an inappropriate response, the courseware will suggest more appropriate responses, sources of information which clarify the subject or prescribe remedial activities. The tutorial continues until the student masters the material or intentionally terminates the session.

3. **The Simulation Mode.** In this mode, the microcomputer acts as a model or construct of a condition.

The student interacts with the model in two ways.

A. The student responds to the model-based questions with answers that effect the model.

B. The student manipulates variables within the model; thereby causing a change in the model which must be analyzed. An inappropriate response can result in the model not "working." For example, in the simulations I use, inappropriate responses tend to cause the student to overrun a budget, volcanoes may erupt suddenly, or oil may not be found.

CAI EXPERIENCES

I use each CAI assignment as an integral part of its respective curriculum rather than an appendage to it. I

have found that students are more likely to complete the assignment when they are made aware that it is not merely "busy work." Toward the idea of the assignment's importance, the students are informed that the CAI material will be on the tests. To further reinforce its importance, the students are given classroom time for the CAI activity.

Over the semesters, I have come to anticipate four conditions when using CAI.

1. **Lack of Typing Skills.** Approximately 25% of any given student group will have no typing experience. An additional 25% may have only finger typing experience. As a result of the lack of typing skills, many students feel that they are at a disadvantage because of the need to communicate with the courseware by typing.

2. **Fear of Microcomputers.** Roughly 10% of any group will have an aversion to microcomputers. Usually, the individuals will have had no experience with microcomputers yet feel threatened by the prospect of using one.

3. **Team Size.** Two to three students working as a team at the microcomputer tends to promote a great amount of personal interaction and sharing of classroom material.

4. **Team Structure.** If there are more than three individuals per microcomputer, pandemonium results. However, if conditions allow, larger groups can be used. For example, I have had six students work as a team with each member acting as the computer operator on a rotating basis.

CONCLUSIONS

My experience with CMI and CAI suggests the following.

1. The benefits of word processing outweigh any special considerations which arise.

2. Record keeping is viable only if I have more than 35 students per class and have assistance with entering the information into the microcomputer.

3. A filing system allows for improved information retrieval and assembly.

4. A graphing program allows me to depict numerical information in a professional manner.

5. Quality courseware exists but it takes a considerable effort to locate.

6. The drill and practice mode of CAI has value for those who need a quick review or remedial work.

7. The tutorial mode can be an excellent means of introducing new material or augmenting student learning.

8. The simulation mode of CAI helps create a realistic situation upon which the student can experiment.

9. CAI must be a recognizable part of the course curriculum if students are to view CAI as anything other than "busy work."

10. Some students are initially hesitant to use the microcomputer but with help they quickly become as competent as the more experienced students.

11. The number of students and structure of a team assigned to a microcomputer is very important.

Overall, I feel that the instructional use of the microcomputer can improve the educational experience for the instructor and the student.

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Screenwriter II, 1981. Coursegold, Ca.: On-Line Systems.

Sensible Speller, 1983. West Bloomfield, Mi.: Sensible Software

The, Lee, 1982. "Squaring Off Over Computer Literacy." *Personal Computing*, September: 58-72.

VisiCalc, 1979. San Jose, Ca.: Personal Software.

APPENDIX A

GRADE SHEET

The grade sheet shown below uses the *VisiCalc* spread sheet program. Once the student's raw test score is entered, the program can be set up to automatically compute the percentage, total number who took the test, and the class average. The grade sheet can be printed. In addition, the test scores or percentages can be converted into a graph.

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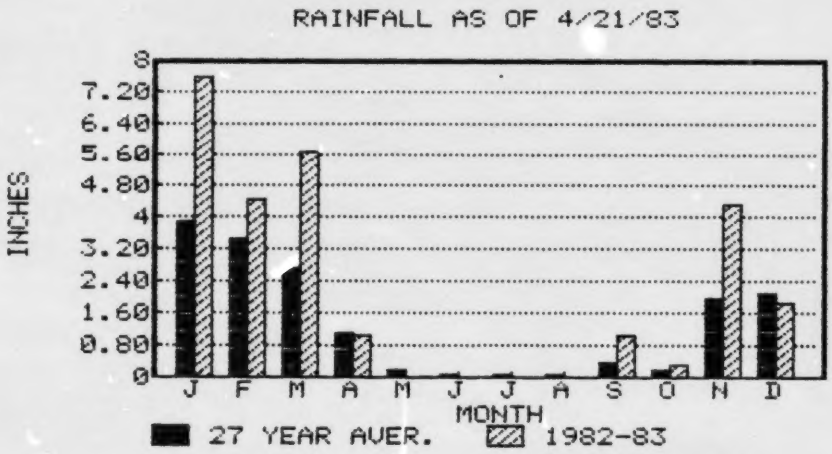
NAME	SSN	TEST #1	PERCENT
1. AGOURA	553-675	37	74
2. BURNIN	557-544	45	90
3. DOMBOW	123-223	32	64
4. DYMSKI	552-897	50	100
5. FRANKL	436-213	43	86
6. GROVER	555-567	35	70
7. LIMMIN	442-456	39	78
8. NUTTIO	110-398	48	96
9. QUITOS	555-143	42	84
10. VERIN	567-930	37	74
	TOTAL	10	
	AVERAGE		82

APPENDIX B

CLASSROOM GRAPH

The graph below was constructed using the *PFS:Graph* program. Twenty seven years of rainfall data were summarized along with the rainfall amounts of early 1983 and entered into the program. Two key strokes caused the program to develop the graph as shown. A transparency was made of the graph for use with an overhead projector.



APPENDIX C

COURSEWARE REVIEW SOURCES

Classroom Computer News. P.O. Box 266, Cambridge, Ma., 02138.

C.U.E. Newsletter. Computer-Using Educators. 127 O'Connor St., Menlo Park, Ca., 94025.

Digest of Software Reviews: Education. c/o School and Home Courseware. 1341 Bulldog Lane, Suite C. Fresno, Ca., 93710.

Dimsdale, Jeffrey M. (ed.), 1982. *A Guide to Microcomputer Programs in the California Community College.* Orange Coast College. ERIC: JC 830 039.

Journal of Courseware Review. 20863 Stevens Creek Blvd., Building B-2, Suite A-1, Cupertino, Ca., 95014.

Lancers. Los Angeles Education Center. 9300 East Imperial Highway, Downey, Ca., 90242.

Microcomputers in Education. Queue, Inc. 5 Chapel Hill Dr, Fairfield, Ct., 06432.

MicroSIFT Courseware Evaluation. Northwest Regional Educational Laboratory. 300 S.W. Sixth Ave., Portland, Or., 97204.

Pipeline. Conduit, P.O. Box 388, Iowa City, Ia., 52244.

Rice (Resources in Computer Education). Computer Technology Program. Northwest Regional Educational Laboratory. 300 S.W. Sixth Ave., Or., 97204.

School Microware Reviews. Dresden Associates, Dept. TCT, P.P. Box 246, Dresden, Me., 04342.

Softswap Microcomputer Center. San Mateo County Office of Education. 333 Main St., Redwood City, Ca., 94063.

The Computing Teacher. Computing Center, Eastern Oregon State College, La Grande, Or., 97850.

APPENDIX D

EARTH SCIENCE COURSEWARE IN USE

Drill and Practice

Minerals. The student is directed to conduct tests on mineral samples. The courseware asks questions about the results of the tests. The student enters the answers into the microcomputer. The courseware focuses on the process of the tests rather than the names of the minerals. The program is used on an individual basis. Available from Sunburst Communications, Inc.

Tutorials

Climate Classification. The courseware titled *Climate Classification* gives the student temperature and moisture data for a specific place. The student is ask questions about the conditions which would result in the temperature and moisture amounts. Next, the student is ask to classify the data using the Koppen climate classification system. Lastly, the student is ask to determine the geographic location of the region and the name of the climate station. A maximum of three students can use the program at one time. Avaliable from the author.

Topographic Mapping. The courseware, *Topographic Mapping*, ask the student for data on the elevation of mountains and valleys. The courseware is then directed by the student to draw several types of maps using the data. For example, the student can specify a contour map, a plastic shaded relief map or a block diagram. Although only one student can use the program at a time, not more than three students can participate in observing the microcomputer draw the maps. However, the program works well as a classroom demonstration. Available from Special Delivery Software.

Simulation

Oil. The courseware allows the computer to become an oil rig. The rig and its drilling activity is controlled by the student. Through an analysis of seismic data provided by the courseware, the student determines the subsurface geology. Next, the student directs the drilling for oil. The student may have a dry hole, strike natural gas or bring in a gusher. I use the program as a team activity where there are six students per team. One student operates the microcomputer while all members are involved with data analysis and the choice of drilling sites. Available from Queue, Inc.

Quakes. This simulation focuses on earthquakes in the western U.S. The computer becomes a reporting network of seismic stations. The student is ask to apply the concepts and computations used by seismologists to locate the epicenters of various earthquakes. I use this program as a classroom demonstration. It tends to work best with only one student using the microcomputer with no others involved. Available from Sunburst Communications, Inc.

Volcano. The courseware *Volcano* and its accompanying syllabus set out a geographic region wherein there are 25 volcanoes. The task of the student is to predict which volcano will next erupt and to issue a timely warning to the residents of the region. The teams are given a research budget to purchase scientific information upon which to base their prediction. I use the program as a team activity with no more than six students per team. Available from Earthware Computer Services.